Columbia River
Cold Water Refugia Plan
(NMFS 2015 Oregon WQS BiOp RPA)

Federal Caucus Meeting
November 2015

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EPA Region 10

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NMFS Jeopardy Finding

- Oregon Columbia/Lower Willamette River Temperature Criteria
  - 20C numeric criteria
  - Cold Water Refugia narrative criteria
    - "must have CWR that's sufficiently distributed so as to allow salmon and steelhead migration without significant adverse effects from higher temperatures elsewhere in the water body"
    - "CWR means those portions of a water body where, or times during the diel cycle when, the water temperature is at least 2C colder than the daily maximum temperature of the adjacent well mixed flow of the water body"
- NMFS concluded CWR narrative criteria is not an effective criteria
- Jeopardy for Steelhead (LCR, UWR, MCR, UCR, SRB); Chinook (LCR, UWR); Sockeye (SR); SR Killer Whales

Columbia River CWR Plan RPA

- EPA shall work with NMFS to facilitate an interagency team to develop a Columbia River CWR plan
- EPA shall work with NMFS, CR Federal Caucus, and the NWPPC to align this work with FCRPS BiOp and Columbia River Fish and Wildlife program
- Columbia River CWR plan due by November 2018

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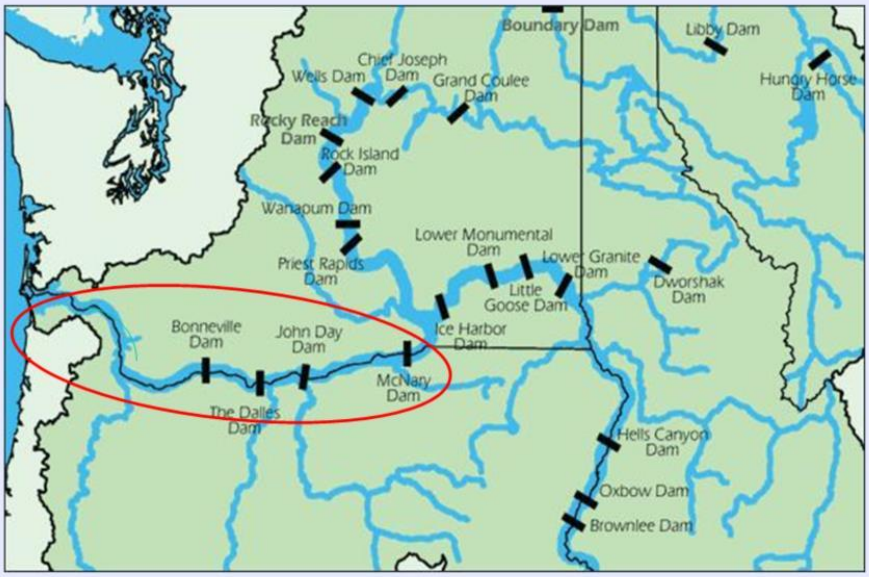
Columbia River CWR Plan Area
RM0-RM310



CWR Plan Elements

1. Characterize current spatial and temporal CWR
2. Characterize current salmon and steelhead use of CWR
3. Identify potential locations to restore CWR
4. Assess whether current CWR is sufficient to meet Oregon's narrative criteria
5. Characterize the additional CWR needed
6. Identify and prioritize actions to protect, restore, or enhance CWR

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Columbia River at Bonneville (Keefer et al.)

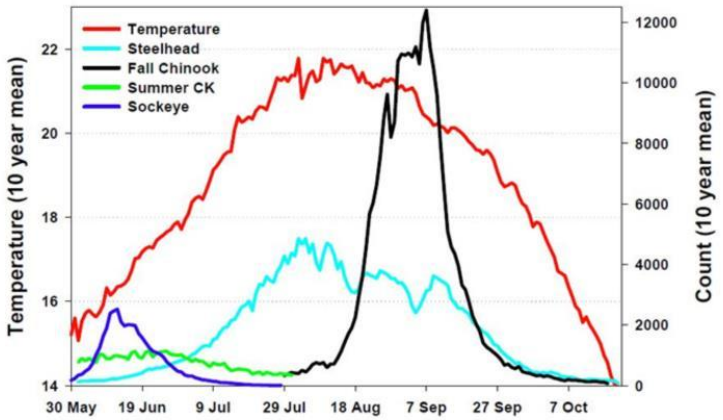

Figure 2. Ten-year (1996-2005) mean lower Columbia River water temperature (°C) and mean run size and timing of adult summer Chinook salmon, fall Chinook salmon, sockeye salmon, and summer steelhead at Bonneville Dam. Thermal refugia use by many adult populations has been associated with water temperatures greater than 19-20 °C.

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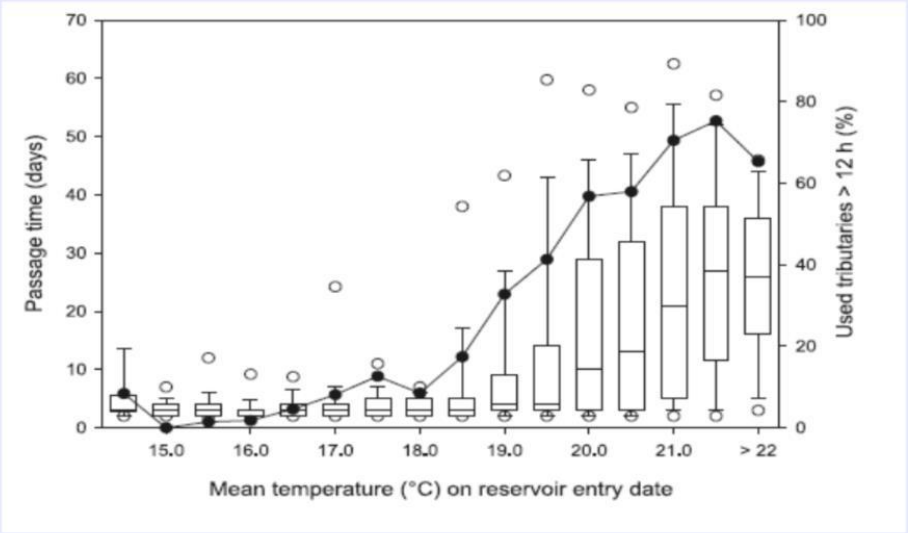
Steelhead CWR use in Bonneville Reservoir (Keefer et al. 2011)



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Fall Chinook Refugia Use (Goinea et al. 2006)

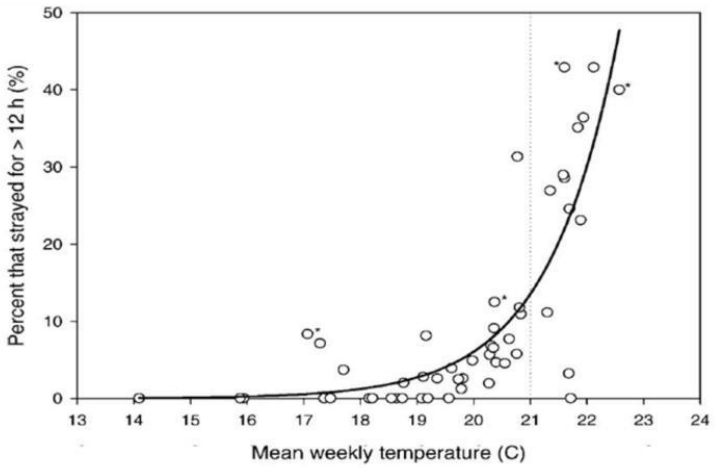

FIGURE 6.—Relationship between the percent of fall Chinook salmon that used (>12 h) coolwater tributaries and mean weekly water temperatures at Bonneville Dam. Circles represent 52 weekly bins (mean = 41 fish/bin; range = 4–122 fish/bin). The curve is the exponential regression line that best fits the data ($r^2 = 0.80$; $P < 0.0001$; percent $= 6.558^{-7} e^{0.802 \times \text{temperature}}$). Asterisks indicate data points with fewer than 10 fish.

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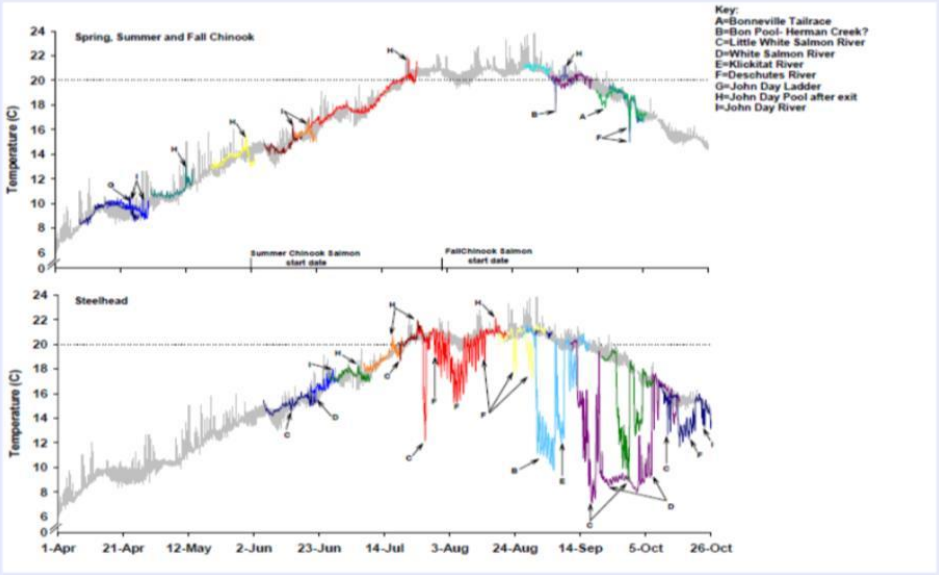
Tracking Internal Temperatures of Individual fish (University of Idaho 2011 Memo)



Steelhead & Refugia (Keefer et al. 2011)

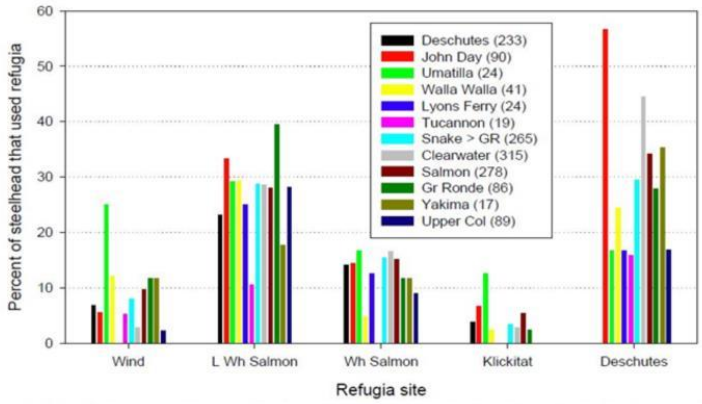


Figure 7. Population-specific use of selected cool-water refugia tributaries in the Bonneville-John Day reach by radio-tagged summer steelhead in 1996-1997 and 2000. Bar colors represent upriver populations, with sample sizes in parentheses. Steelhead additionally used Herman and Eagle creeks, but these small sites were inconsistently monitored in these study years. A small number of steelhead temporarily used the Hood River (not shown).

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Little White Salmon CWR

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Deschutes River CWR

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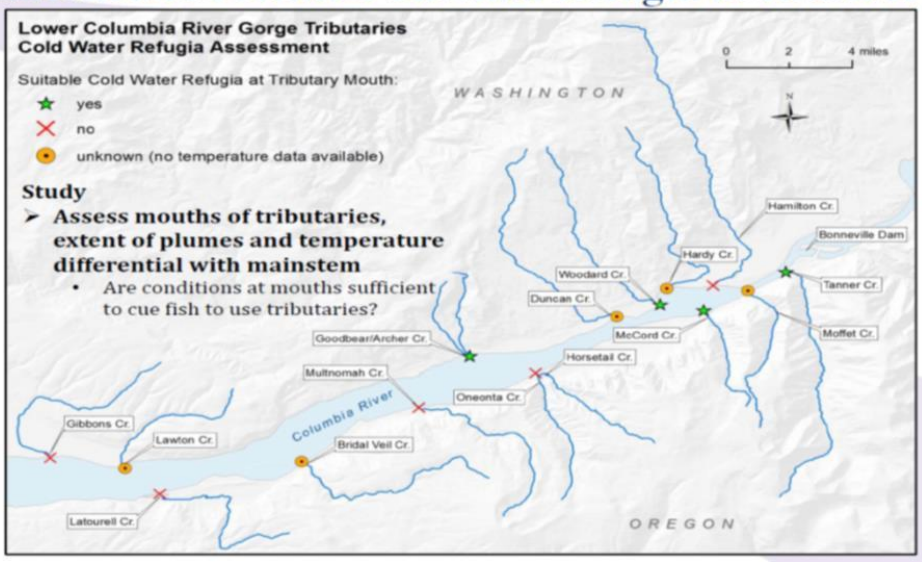
Lower Columbia Estuary Program
CWR Project

Current and Potential Thermal Refugia in Reach H



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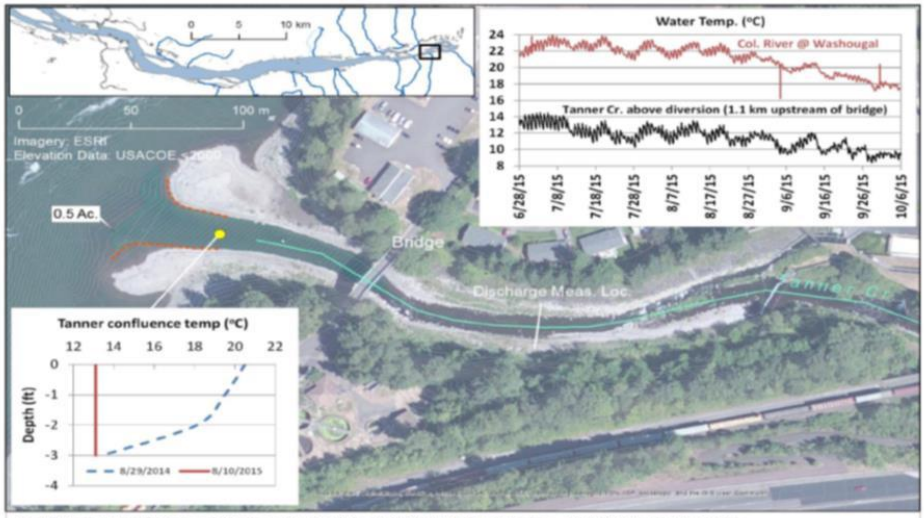
Tanner Creek CWR



Cold Water Discharge at Tanner Cr. Outlet: 08/29/2014 @ 10:30 hrs., 08/5/2015 @ 13:00 hrs.

Approx. cold water extent @ 3 ft. depth (T < 20 C)

Approx. water edge at time of survey

0.5 m elev. contours

Lower Columbia Estuary Partnership

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CWR Plan Initial Data & Analysis Needs

- Tributary temperature data/monitoring
  - Need continuous temperature monitoring - John Day, Klickitat, Little White Salmon, White Salmon, Wind, Hood, Eagle, Herman, Washougal, Sandy…
- Steelhead/Salmon tag studies
  - Below Bonneville Dam
  - Additional studies above Bonneville
  - How far up tributaries do fish use a CWR
- Columbia River temperature data/monitoring
  - Vertical temperature profiles in reservoirs
  - CWR below dams
- Characterization of tributary plumes
  - Spatial extent across summer
  - Geomorphologic considerations

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Opportunities for Cooler Columbia River Summer Temperatures?

- Review of 2015
  - NOAA after action report for 2015
  - What could be done if we experience similar conditions in the future?
- Cool water release opportunities?
- Importance and opportunities to modify flow during warm temperature periods?
- Cool forebay/fish ladder temperatures?

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Columbia River Sockeye - Summer 2015 (Temperatures)

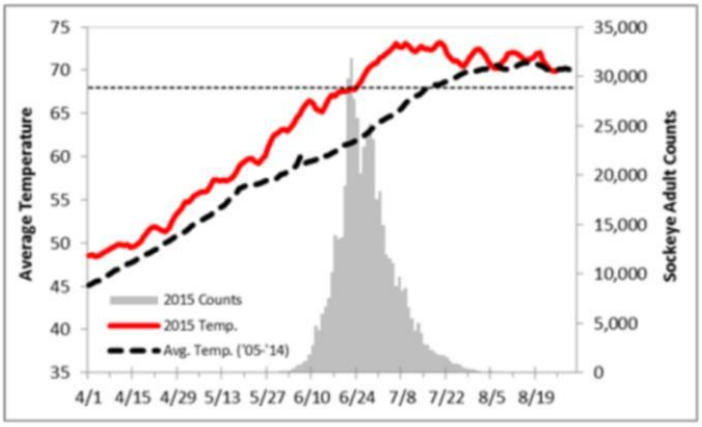

Figure 6. Water temperature at Bonneville Dam in 2015 compared to the average for the past 10 years, and the adult sockeye dam counts at Bonneville Dam in 2015.

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Columbia River Sockeye - Summer 2015 (Flows)

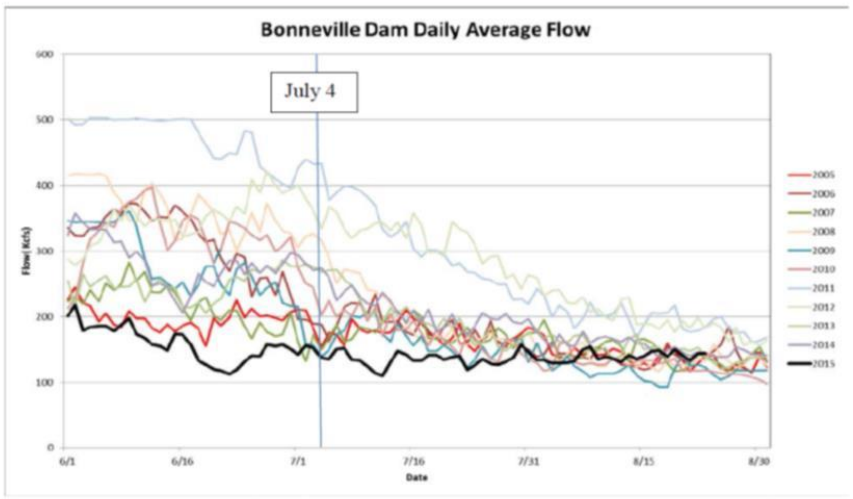

Figure 3. Daily average flow at Bonneville Dam for June-August 2005 to 2014 and observed thus far for 2015.

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Federal Caucus Temperature Workgroup?

- Scope and Purpose?
  - Assist EPA in CWR plan
  - Assist NOAA with 2015 after-action report
- Member Organizations?
  - Federal Caucus agencies
  - OR, WA, Tribal, LCEP, others
  - EPA & NOAA co-lead
- Workgroup members?
- Meetings?
  - December 2015 Kick-off meeting
  - Monthly/Bi-monthly
- Federal Caucus CWR Workshop?

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